

# Chemical Industry Views on Facilitating Industrial Small Modular Reactor (SMR) Deployment

Small Modular Reactors (SMRs)<sup>1</sup> represent a promising technology for providing low-carbon electricity and heat **on a large scale** and in a **baseload profile**. Their modular design makes them potentially suitable for integration into industrial sites with diverse requirements for decarbonised energy. Consequently, SMRs could serve as a key facilitator in the transition of energy-intensive industries towards climate neutrality.

In this paper, we outline the critical enabling conditions for SMRs **from the perspective of the chemical industry**, focusing on our role as industrial energy consumers and not as nuclear experts.

The chemical industry is the largest industrial electricity consumer in the EU (165 TWh/ year, 2021). That consumption is set to increase by up to 4 times<sup>2</sup> in the transition to climate neutrality. To meet this rising demand for electricity, it is crucial to have **competitive electricity costs** that sufficiently **incentivise industrial electrification**. These are ideally provided in a baseload profile that matches industrial demand patterns.

For a full overview of our sector's energy needs, [refer to this paper](#).

Low-carbon electricity generation, like SMRs, can help meet these energy needs - as part of a **technology-positive** basket of options that encompasses all renewable and low-carbon generation. If deployed at scale, on-site low-carbon generation could reduce the need for additional off-site capacity and grid scale-up. They may even provide dispatchable capacity to help balance the grid.

While SMRs are, in the case of light water reactors, based on existing technology, considerations to deploy them directly on industrial sites are relatively new. Among others, their deployment relies on a forward-looking approach to policymaking as part of a broader EU Industry Deal.

We consider the European Industrial Alliance on SMRs an important step for identifying the right enabling factors and regulatory bottlenecks through the participation of industrial end-users.

In anticipation of the work of the Alliance, **the chemical industry makes the following recommendations:**

1. **Anticipate Permitting Bottlenecks Ahead of Time**
  - a. Create coherence between Member States' permitting approaches and facilitate the exchange of best practices to reduce lead times. Standardisation and pre-licensing of a given model of SMR can further aid in accelerating deployment.
2. **Pave the Way for SMR Integration in the EU's Energy Landscape**
  - a. Provide guidance (and implementation) for the treatment of on-site distribution grids.
  - b. Remove barriers to the contribution of nuclear energy to the EU's climate targets.

<sup>1</sup> Meaning nuclear reactors with a power output of between 10 megawatt electric (MWe) and 300 MWe.

<sup>2</sup> [Transition pathway - European Commission \(europa.eu\)](#)

- c. Leverage the NZIA concept of industrial valleys to speed up the deployment of SMRs.
  - d. Level the regulatory playing field between low-carbon and renewable energies, across production pathways, for hydrogen and electricity.
- 3. Address Financing Barriers to Drive SMRs to Scale**
- a. Provide EU-level funding support through IPCEIs, EIB instruments, as well as a review of the CEEAG framework to assess the need for integrating nuclear energy in the scope.
- 4. Clarify a Framework for Safety and Liability of Nuclear Assets on Industrial Sites**
- a. Review the existing liability framework for nuclear assets specifically in anticipation of SMR deployment on industrial sites.
  - b. In the interest of reducing lead times, that liability framework should be coordinated as much as possible at the EU level.

## Policy Recommendations

### Anticipate Permitting Bottlenecks Ahead of Time

The permitting of large-scale nuclear plants follows a lengthy, but well-established process in the EU aiming to ensure the highest nuclear safety standards. Permitting procedures for SMRs differ from large-scale reactors – and will need to be developed in conjunction with actual SMR projects to ensure smooth deployment.

The possible deployment of SMRs on industrial sites warrants particular attention from a permitting perspective. The chemical industry is subject to a comprehensive permitting and regulatory regime that includes the Seveso Directive III, the Industrial Emission Directive, as well as EU- and national legislation regulating on-site electricity and gas grids, amongst others.

SMR projects on industrial sites will interface with these regulatory regimes in addition to the nuclear permitting required for the SMR technology itself. There may also be national legislation which currently prohibits nuclear energy or foresees a nuclear phase-out. That may have to be addressed at the respective levels given EU Member States' autonomy regarding the energy mix. This will lead to permitting challenges that are new, but not unforeseeable.

- **Recommendation:** Anticipate regulatory & permitting challenges by facilitating stakeholder exchanges between SMR developers, regulators, and industrial end-users at the EU level. These should aim to create coherence between Member States' permitting approaches and facilitate the exchange of best practices to reduce lead times. Standardisation and pre-licensing of a given model of SMR can further aid in accelerating deployment.

Surveying the list of current SMR projects<sup>3</sup>, it becomes apparent that outside of the EU, the deployment of these technologies is speeding up. That is principally a function of political will. At the same time, the high population density and the location of industrial sites close to urban areas present unique challenges to SMR development in the EU. If SMRs are to have a future on the EU's industrial sites, they will need to win the buy-in of the local communities that they neighbour.

---

<sup>3</sup> [https://aris.iaea.org/Publications/SMR\\_booklet\\_2022.pdf](https://aris.iaea.org/Publications/SMR_booklet_2022.pdf)

- **Recommendation:** Engage local governments and communities in early stakeholder exchanges surrounding SMR development to limit the risk of lengthy challenges to the permit granting process.

## Pave the Way for SMR Integration in the EU's Energy Landscape

The integration of SMRs into the EU's energy system shares similarities with existing large-scale power generation. Consequently, they benefit from similar regulatory enablers. However, due to the decentralised nature of SMR technology and its potential placement directly on industrial sites, it may require additional regulatory scrutiny.

For instance, the regulatory regime surrounding closed on-site grids for electricity remains underdeveloped in some Member States, particularly in Iberia. This effectively inhibits the establishment of these grids, which play an essential role in locally distributing the electricity generated on-site.

- **Recommendation:** Provide clear regulatory guidance for closed on-site distribution grids and ensure the timely national implementation of that guidance.

The long-term storage of spent fuel of SMRs will also need to be anticipated. Most industrial sites are not equipped to handle the treatment of spent fuel on-site. Hence, industrial users will be particularly reliant on the SMR provider or centralised storage to handle spent fuel, possibly across Member States borders.

- **Recommendation:** Establish a cohesive EU framework for the handling of SMR spent fuel off-site in a way that minimises barriers across Member States.

The recently finalised Net-Zero Industry Act (NZIA) affirms the role of nuclear energy in reaching the EU's climate objectives. The contribution of that energy carrier should be affirmed more broadly across the EU regulatory landscape.

- **Recommendation:** Building on the learnings of the NZIA, remove barriers to the contribution of nuclear energy to the EU's climate targets.
  - Leverage the NZIA's concept of industrial valleys to speed up the deployment of SMRs in energy-intensive industrial clusters.

SMRs – similar to large scale nuclear generation – can also provide electricity to run electrolyzers that produce hydrogen. The resulting hydrogen would likely classify as low-carbon as per the Gas Directive article 8. However, despite its GHG-savings threshold being identical to that of renewable hydrogen, it enjoys considerably fewer regulatory benefits. Building a business case for SMRs will require revisiting the regulatory treatment of low-carbon hydrogen

- **Recommendation:** Level the regulatory playing field between low-carbon and renewable energies, across production pathways, for hydrogen and electricity.

## Address Financing Barriers to Drive SMRs to Scale

It is too early to describe definitively the levelized cost of electricity of on-site SMR generation. Early exchanges with project developers suggest a cost structure that features substantial CAPEX investments that are offset over time with lower OPEX compared to purchasing electricity from the grid.

Choosing between different energy sourcing strategies will firmly remain the decision of individual companies. However, high grid electricity costs in the EU and rising network charges make on-site generation an increasingly attractive option for industrial energy sourcing. That being said, considerable CAPEX requirements, as well as high-risk premiums – amongst others - remain prohibitive to that option.

- **Recommendation:** Facilitate funding support for industrial SMRs to drive the technology to scale. The US Inflation Reduction Act (IRA) and Advanced Reactor Demonstration Program (ARDP) provide workable models for structuring support.
  - These should be emulated through EU-level funding support through IPCEIs, EIB instruments, as well as a review of the CEEAG framework to assess the need for integrating nuclear energy in the scope.
  - These measures may be complemented by EU-level auctioning of aid that is backed up by state aid (following the example of the international arm of the hydrogen bank).

## Clarify a Framework for Safety and Liability of Nuclear Assets on Industrial Sites

To succeed with SMR deployment, new players in the nuclear market, like industrial companies, will rely on service providers to deploy, operate, and – in some cases – own the respective assets on their site. These new forms of collaboration can also help reduce uncertainty and cost regarding the legal and financial liability for nuclear assets on industrial sites. That is necessary, because these uncertainties present a substantial entry barrier to SMR deployment for industrial companies, with little experience in the respective legal frameworks and insurance markets.

For these new forms of collaboration to flourish, the legal framework for the liability surrounding nuclear assets, as well as that of the (spent)-fuel, will need to anticipate the market entry of industrial companies.

In addition, the present regulatory regime surrounding the liability for nuclear assets in case of accidents has been developed for large-scale reactors. These reactors have a very different risk profile to SMRs. Resultingly, the present legal regime – at national and international levels – may need to be revisited to anticipate the penetration of new SMR technology.

- **Recommendation:** Review the existing liability framework for nuclear assets specifically in anticipation of SMR deployment on industrial sites<sup>4</sup>. That liability framework should provide clarity in responsibility between SMR technology providers and industrial off-takers to minimise system costs.
  - In the interest of reducing lead times, that liability framework should be coordinated as much as possible at the EU level; where rules are set internationally, the EU should engage early with international partners to prepare the legal framework accordingly.

---

<sup>4</sup> For instance via an update to the JRC Report (2022) – [JRC Publications Repository - Applicability of the international nuclear legal framework to small modular reactors \(SMRs\) \(europa.eu\)](#).

For more information please contact:  
Nicolai Romanowski, Energy Manager  
Cefic  
Tel. +32496266052, nro@cefic.be

**About Cefic**

Cefic, the European Chemical Industry Council, founded in 1972, is the voice of large, medium and small chemical companies across Europe, which provide 1.2 million jobs and account for 15% of world chemicals production.